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**GREATER TORONTO AREA 3Rs ANALYSIS
SUMMARY REPORT - DURHAM REGION**

DRAFT - NOVEMBER 1993



**Ministry of
Environment
and Energy**

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GREATER TORONTO AREA 3Rs ANALYSIS
SUMMARY REPORT - DURHAM REGION

Prepared by M.M. Dillon Ltd.
for
Fiscal Planning and Information Management Branch
Ministry of Environment and Energy

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1.0 BACKGROUND

In 1989, the government of Ontario announced its commitment to meeting a Provincial target of at least 50% reduction of waste going to landfills and incineration by the year 2000. This target, a waste **diversion** target to be achieved through waste reduction, reuse and recycling (the 3Rs), was confirmed by the present government in 1990.

To facilitate the achievement of the 50% target, the Province introduced the *Waste Management Act*, 1992. The Act broadens the government's powers to reduce waste sent to disposal through a variety of means. It also vests powers in the Interim Waste Authority (IWA), an agency created to ease the waste disposal crisis in the Greater Toronto Area (GTA). The IWA is complying with its mandate by conducting environmental assessments to locate three long-term landfill sites in the GTA.

2.0 PURPOSE OF STUDY

This study has two purposes, each of which relates directly to a requirement created by the *Waste Management Act*.

The first requirement pertains to waste estimates: Section 14 of the *Waste Management Act* requires the Minister of Environment and Energy to provide a written estimate as to:

- a) *the amount of waste that would otherwise be expected to be generated in the primary service area (i.e. each of Peel, Durham and Metro/York) during a twenty-year period that will not be generated because of waste reduction efforts; and*
- b) *the amount of waste that will be generated in the primary service area during a twenty-year period that will not need to be disposed of in the site because of the reuse or recycling of materials that are or could become waste.*

These waste estimates were provided to the IWA by Minister's letter dated May 15, 1992 (Appendix A). The current study provides additional analysis of 3Rs activities, in support of the waste diversion estimates previously provided.

The second requirement pertains to analysing the 3Rs as "alternatives to" landfill waste disposal sites. Section 15 of the *Waste Management Act* requires that the IWA environmental assessments contain a description of, and statement of rationale for the 3Rs,

as well as evaluate matters relating to the 3Rs as an alternative to the landfill waste disposal sites. By administrative agreement, MOEE committed to provide such a rationale and evaluation to the IWA for use in its environmental assessments.

3.0 STUDY APPROACH

For purposes of the present analysis, an array of conceptually different 3Rs systems have been identified for addressing residential wastes, as well as for institutional, commercial, and industrial (IC&I) wastes. For each system, estimates of the amount of waste the system could potentially divert from disposal have been determined. An assessment, done on a non-site-specific, generic level, identifies the advantages and disadvantages to the environment of each potential 3Rs system, in keeping with the *Environmental Assessment Act*.

The study area for the GTA 3Rs Analysis is the area encompassing Metro Toronto and the Regional Municipalities of Durham, York, Peel and Halton. Metro Toronto/York Region, Durham Region and Peel Region are defined as the "primary service areas". The Region of Halton has been included as part of the study area as it is part of the GTA. It is not, however, one of the three "primary service areas" as it has recently obtained approval for a landfill site, and is not part of the IWA siting process. The residential 3Rs systems were analyzed in the context of each of the four municipalities of Metro, York, Peel and Durham. The IC&I systems were analyzed in the context of the larger GTA (i.e. including Halton) as IC&I waste management systems transcend municipal boundaries.

3.1 Study Process Overview

The GTA 3Rs Analysis identifies and assesses alternative 3Rs systems, comprised of combinations of 3Rs programs, technologies and practices, that could reasonably be implemented in the GTA. It also determines the potential for each 3Rs system to divert waste over the twenty-year minimum life expectancy of the GTA landfill sites, and identifies the advantages and disadvantages of each system.

The study process selected was one modelled on the intent and requirements of the *EA Act*. Specifically, the study process:

- considered a reasonable range of alternatives;
- considered the full definition of the environment;

- systematically evaluated the net environmental effects of the options being considered; and
- considered public views on waste diversion.

Figure 2.1 presents the study process.

Key to the design of alternative systems was to identify the Existing 3Rs system within each of the Regional Municipalities (Step 1). The Existing system or "do nothing" alternative was identified as the 3Rs system in place within each Regional Municipality as of December 31, 1992. The Existing system was described for both the residential/municipal sector for each Regional Municipality, and for the IC&I sector at the GTA level.

Using the Existing system as a base, the next step (Step 2) was to identify Regional, Municipal, Provincial and Federal, five year 3Rs commitments. Once identified, these 3Rs commitments were then translated into components and added to the Existing system to form the Existing/Committed system (January 1, 1993 to December 31, 1997).

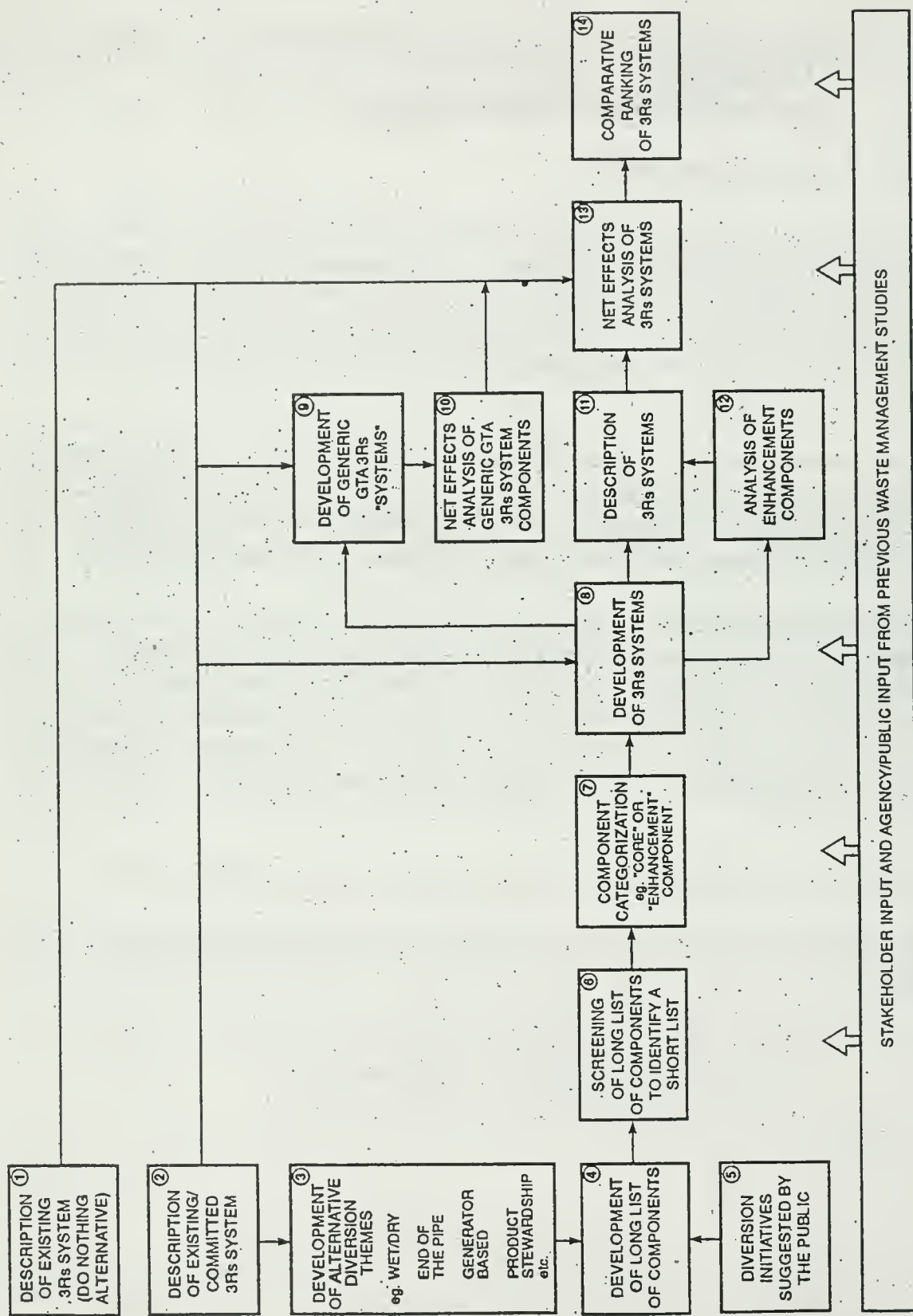
The alternative diversion themes were then developed by the study team¹ (Step 3). These represented the conceptual waste diversion options which are/can be expected to be available. The diversion themes identified by the study team were then used to develop a long list of waste diversion components which served as the building blocks for the system development (Step 4). Included in this long list were components suggested by the public and identified by the study team from existing reports and past public consultations (Step 5).

The long list of components was then screened (Step 6) using three criteria.

To pass the screen and proceed to the next step in the evaluation, each component was judged to:

- represent a proven technology, technique or program;
- satisfy government standards and regulations; and
- divert a reasonable quantity of waste from disposal.

¹ The study team was managed by MOEE's Fiscal Planning and Information Management Branch and included four separate consulting firms.



**GTA 3Rs SYSTEM DEVELOPMENT
AND EVALUATION APPROACH**

Step 6 screening identified a short list of alternative 3Rs system components.

The short listed components were then categorized as either core or enhancement components (Step 7). Core components served as the focus for alternative system development.

Enhancement components could be added to systems to enhance system performance and increase waste diversion. Enhancement components were further divided into primary and secondary enhancement component categories. Primary enhancement components (e.g. promotion and education) are proven to add an important element that would contribute to the function of a waste diversion system. Secondary enhancement components could be added to systems to increase waste diversion, but were not considered critical to their function. Only core and primary enhancement components were included in alternative waste diversion systems developed for analysis in the GTA.

Based on the categorized components, alternative systems were then developed (Step 8) and then described (Step 11).

The next step was to determine the net effects of each system on the basis of the following criteria groups: Cost, Municipal Finance, Natural Environment, Service and Social Environment.

Recognizing the amount of overlap between the Regional systems, a net effects analysis at a GTA level was first done on all the components found within each of the systems developed for each of the Regional Municipalities (Steps 9 and 10). The components and their net effects were then recombined into the Regionally based 3Rs systems to create the Net Effects Analysis for each individual system for each Region (Step 13).

Based on the net effects, the final step of the study process was the ranking of each alternative system within each criterion group (Step 14).

3.2 Overview of the Alternative System Development Process

A total of six residential and six IC&I waste diversion systems were developed for comparison in the GTA 3Rs Analysis. In order to conduct this analysis, a methodical system development process was undertaken. The objective was to group together a wide range of alternative waste diversion components into logical systems which could potentially be used for waste diversion, without undue complexity, in the GTA. The method used for system development is illustrated in Figure 2.2.

The systems were developed to provide a basis for comparing alternative waste diversion approaches. No attempt was made to analyze all possible systems, nor was this an attempt to provide conclusive recommendations of preferred systems for waste diversion in GTA Regions. The range of alternative systems developed was however considered to be reasonable for the GTA. It will also be the municipalities themselves who decide which system is most appropriate considering their own local issues/conditions.

The system development process consisted of six steps:

1. Defining Key Assumptions
2. Identifying Waste Diversion Themes
3. Identifying Long List of Components
4. Screening Long List of Components
5. Developing Potential Alternative Residential Waste Diversion Systems for the GTA.
6. Developing Potential Alternative IC&I Waste Diversion Systems for the GTA.

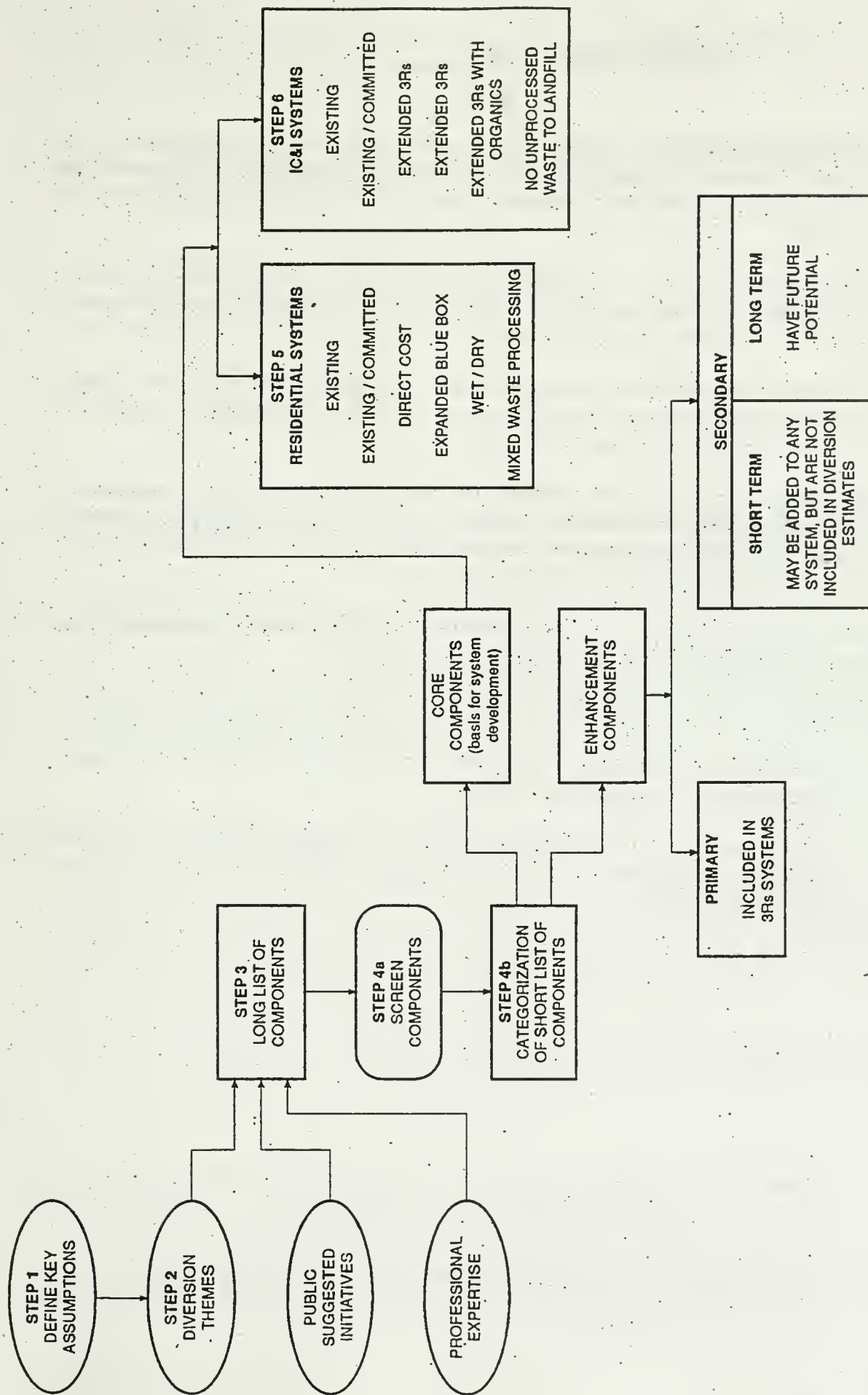
3.3 Identification of Alternative 3Rs Systems

For each Region, six residential 3Rs systems were developed and evaluated. These systems were:

Residential

Residential System 1 - Existing - the residential 3Rs system which was in place in each Region on December 31, 1992.

Residential System 2 - Existing/Committed - the Existing system, to which are added policies announced by December 31, 1992, and programs committed in municipal five-year budgets (to the end of 1997).



GTA 3Rs ANALYSIS
3Rs SYSTEM DEVELOPMENT PROCESS

Residential System 3 - Direct Cost - builds on the Existing/Committed system which includes a charge to the homeowner for garbage collection, and uses Blue Box programs, backyard composting and curbside collection of leaf and yard waste.²

Residential System 4 - Expanded Blue Box - range of dry recyclables collected at the curb is expanded, and household organics (food and yard waste) are managed through backyard composters and separate collections of leaf and yard waste.

Residential System 5 - Wet/Dry - household waste is collected in three streams including wet (food and yard wastes), dry recyclables, and garbage. A centralized composting facility processes the wet wastes.

Residential System 6 - Mixed Waste Processing - includes Blue Box collection of recyclables, separate collection of leaf and yard waste, backyard composting of some household wet waste and processing of the remaining "third bag" of waste in a mixed waste processing and composting plant.³

For the GTA as a whole, six 3Rs systems to handle industrial, commercial and institutional (IC&I) waste were also developed. These were:

IC&I

IC&I System 1 - Existing - comprises the IC&I waste management system in place in the GTA on December 31, 1992.

IC&I System 2 - Existing/Committed - the Existing system with policy commitments announced at the local, Regional, Provincial, and Federal levels by December 31, 1992.

² It should be noted that System 3 (Direct Cost) was further subdivided as System 3A (Direct Cost - revenue neutral) and System 3B (Direct Cost - added revenue). Only the Municipal Finance Criteria Group considered these two scenarios in the net effects analysis.

³ System 6 (Mixed Waste Processing) included two scenarios: 1) System 6A - low quality compost; 2) System 6B - high quality compost. These two scenarios address the different ranges of compost quality and end-use possibilities.

IC&I System 3 - Extended 3Rs Regulations⁴ - the Existing/Committed system plus an extension of the proposed 3Rs regulations to include more IC&I waste generators.

IC&I System 4 - Expanded 3Rs Regulations - the Existing/Committed system plus extension of the proposed 3Rs Regulations to include more IC&I waste generators and source separation of a larger range of dry materials by the IC&I sector.

IC&I System 5 - Expanded 3Rs Regulations with Organics - builds on System 4 and includes wet wastes in materials requiring source separation by the IC&I sector.

IC&I System 6 - Processing All IC&I Waste - builds on the Existing/Committed IC&I system, but would require that all IC&I waste be processed prior to landfilling.

4.0 CONSULTATION ON GTA 3Rs ANALYSIS

The purpose of the consultation program for the GTA 3Rs Analysis is to identify and consider the views and suggestions of relevant stakeholders. Stakeholders include both members of the public and government agencies. Consultation is occurring over three stages.

4.1 Stage 1 - Consultation Program

The Stage 1 consultation program conducted for the GTA 3Rs analysis project commenced on June 4, 1992, at the same time the IWA announced its Long List of Candidate Landfill Sites. At this time, the consultation focus was on the GTA waste diversion estimates provided by the Minister to the IWA on May 15, 1992.

As part of this consultation program, representatives of the Ministry also met with Regional Consultation Networks (RCN) (multi-stakeholder committees representing various interests in each Primary Service Area which have met throughout the IWA process).

⁴ The draft 3Rs Regulations were announced by the MOEE in April 1993, and include provisions for mandatory source separation programs, waste audits and packaging audits for designated IC&I sectors. For a general description see *Quick Facts: Ontario's New 3Rs Regulations* (PIBS 2528b: MOEE, Spring 1993).

4.2 Stage 2 - Review of Waste Management Initiatives and Related Consultation Programs

The GTA 3Rs Analysis study team also examined past (GTA and Provincial) waste management initiatives and the results of the consultation conducted for these. Materials from the following studies were reviewed:

- Solid Waste Environmental Assessment Project (SWEAP) Metro Toronto;
- Solid Waste Interim Steering Committee (SWISC) approach to landfill siting and waste management;
- Waste Reduction Office Waste Management Initiatives Papers; and
- IWA Landfill Site Search Public Consultation Documentation.

As outlined, the results of the IWA's consultations were reviewed with particular notice paid to comments made on 3Rs within the GTA. Information collected was reviewed and considered at various stages of the project. As most of the comments identified were suggested 3Rs initiatives which should be considered, public comments were primarily used in developing the long list of 3Rs components and subsequent system development.

4.3 Stage 3 - Future Consultation Activities

In the Fall of 1993 and early 1994, the study team will undertake further consultation on the EA Input document, in co-ordination with the IWA. Activities are planned to inform the public, municipalities and government agencies of the results of the GTA 3Rs analysis and to request their comments on the methods, assumptions and information used in the analysis, as well as the study results. This summary document is one informational tool to be used in Stage 3 consultation.

Based on input received from all of the above consultation activities, data will be updated and the final draft EA Input Document revised for formal submission to the IWA.

5.0 SYSTEM NET EFFECTS ANALYSIS

5.1 System Net Effects Analysis Approach

The following describes the approach followed in the net effects analysis and evaluation.

5.1.1 Evaluation Criteria

Based on the study team's understanding of the issues and scope of the study, a set of criteria and indicators was developed as presented in Table 5.1.

These criteria were categorized under the following criteria groups:

- Cost;
- Municipal Finance;
- Natural Environment;
- Service; and
- Social Environment.

These criteria groups formed the basis of the 3Rs systems evaluations within each Region.

5.1.2 Evaluation Criteria Ranking

To facilitate the ranking of systems on the basis of each criteria group, the criteria within each criteria group were ranked in terms of their level of importance. The criteria rankings were used consistently for each Region, due to the generic nature of the analysis and similarities among the study areas. For example, the type of natural environment effects in Durham would likely be similar to effects in Peel.

The rankings range from 1 (most important) to 3 (least important) and are based on a comparison of each criterion against the others in that group.

TABLE 5.1

GTA 3Rs ANALYSIS
ALTERNATIVE SYSTEM EVALUATION CRITERIA
RESIDENTIAL AND IC&I

Criteria Group/Criteria	Rank*	Indicator
Cost (Residential)		
Cost per Household (system)	NR**	the cost of the waste management system including diversion and disposal on a per household basis
Cost (IC&I)		
Diversion System Cost	2	the cost of the diversion system as expressed as cost per tonne diverted
Total System Cost	1	the cost of the total waste management system (disposal plus diversion)
Municipal Finance		
Potential for Impact on Debt Burden of Municipality	1	<ul style="list-style-type: none"> amount of debenture (long-term) debt annual debt payments as a percentage of Revenue Fund Expenditures (OMB/MMA Guidelines) available debt capacity for other municipal purposes (OMB/MMA Guidelines)
Potential for Impact on Level of Municipal Service	1	<ul style="list-style-type: none"> total municipal wages/salaries, material and contract expenditures expressed as a per household basis current expenditures for each functional department, net inter-department transfers, transfers to reserves, capital costs and debt charges, expressed on a per household basis
Potential for Impact on Local Taxpayers	1	<ul style="list-style-type: none"> total increase in the net general municipal levy net general municipal levy, adjusted for commercial/industrial property assessment, expressed on a per household basis (tax proxy)
Potential for Impact on Municipal Reserve Funds	1	<ul style="list-style-type: none"> total amount of reserves and reserve funds Reserves and Reserve Funds expressed on a per household basis Reserves and Reserve Funds expressed as a percentage of operating expenditures
Potential for Impact on Private Sector Industries	1	<ul style="list-style-type: none"> the total amount of private sector funding applied to each system alternative the amount of additional private sector costs applied to each system alternative the amount of additional private sector costs passed on through higher prices the cost/savings of the system alternative when financed by the private sector through additional taxes, tax incentives, or market/ economic incentives
Natural		
Potential for Effects to Terrestrial Systems and Resources	3	<ul style="list-style-type: none"> potential for loss or removal of terrestrial systems and resources potential for disruption effects to terrestrial systems and resources

TABLE 5.1
GTA 3Rs ANALYSIS
ALTERNATIVE SYSTEM EVALUATION CRITERIA
RESIDENTIAL AND IC&I
(continued)

Criteria Group/Criteria	Rank*	Indicator
Potential for Effects to Aquatic Systems Including Surface and Ground Water Resources	1	<ul style="list-style-type: none"> potential for loss or removal of aquatic systems including surface water resources potential for disruption effects to aquatic systems including surface and ground water resources
Potential for Effects to the Atmospheric Environment	1	<ul style="list-style-type: none"> potential for atmospheric emissions
Service***		
Reliability	1 (1)	<ul style="list-style-type: none"> proven technology(ies) based on experience in other jurisdictions degree of reliance on single approach
Flexibility	3 (2)	<ul style="list-style-type: none"> types and range of quantities accepted compatibility with Existing system
Performance	1 (1)	<ul style="list-style-type: none"> quantity diverted or requiring landfilling
Social Acceptability	2 (1)	<ul style="list-style-type: none"> participation in 3Rs (current and future) by: <ul style="list-style-type: none"> individuals municipalities IC&I sector special/sensitive groups attitudes and perceptions toward 3Rs activities willingness to pay
Social		
Potential Local Community Impacts	1	<ul style="list-style-type: none"> potential effects on residents potential effects on special/sensitive groups potential effects on communities potential effects on community features
Potential for Broad Social Impact	1	<ul style="list-style-type: none"> potential for lifestyle changes potential effect on employment potential effect on economic development potential operational effects on institutions, commercial enterprises and industry
Distribution of Social Costs and Benefits	1	<ul style="list-style-type: none"> distribution of socio-economic effects on industry and population groups distribution of lifestyle effects potential future generation effects of system

* "1" represents most important while "3" represents least important.

** Not ranked.

*** Ranking of criteria within the Service Criteria Group distinguished between the residential and IC&I systems. Ranking for IC&I system is indicated in brackets.

5.1.3 Net Effects Analysis

Based on the descriptions of the 3Rs systems and the criteria developed by the study team, a net effects analysis was undertaken for each component contained within each system. This net effects analysis was not specific to Regional conditions, rather it considered the generic effects and mitigation associated with the components of each system in the context of the larger GTA. Recognizing the amount of overlap among the alternative systems, this approach was undertaken to reduce the number of net effects tables which would be either the same or very similar. Although the components were organized by each of the developed alternative systems, the GTA-based generic net effects were not summarized at the system level. Rather, the net effects were only developed for each of the component *categories*. The component categories served as groupings of similar components (for example the category of residential recycling would have several recycling related components within it).

It should be noted that GTA-based generic net effect tables were not generated for the Cost and Municipal Finance Criteria Groupings as it was not possible to assess potential generic impacts for these two groupings.

In developing the net effects, general mitigation and enhancement measures were developed for the types of potential effects identified to avoid, eliminate or minimize negative effects and, where feasible, to enhance the positive effects.

5.2 **Durham Region Residential Systems Evaluation**

The following discusses the Durham 3Rs system rankings by criteria group.

5.2.1 Cost Criteria Group - Overall System Ranking

Systems 1 to 5 have system costs (measured as costs/household/year) in the range of \$105 to \$112 household/year at low disposal rates and \$132 to \$140/household/year at higher disposal rates. Within the accuracy level of this study, these costs are considered equal. System 6 (Mixed Waste Processing), has an overall system cost of \$171 to \$176/household/year, if the Mixed Waste Processing system produces high quality compost, and \$178 to \$193/household/year if the system produces a low quality compost (i.e. greater quantities of material from the mixed waste plant are landfilled due to product quality limitations). It also had significantly higher costs per tonne diverted, and higher diversion costs per household than the other systems. The higher overall costs of this

system; whether low quality or high quality compost are produced, are related to the high capital costs involved, and the on-going high operating costs.

The Durham 3Rs system rankings for the Cost Criteria Grouping are summarized as follows (highest ranked [i.e. lowest impact] to lowest ranked [i.e. highest impact]):

- 1 - System 1 (Existing)
- 1 - System 2 (Existing/Committed)
- 1 - System 3 (Direct Cost)
- 1 - System 4 (Expanded Blue Box)
- 1 - System 5 (Wet/Dry)
- 6 - System 6B (Mixed Waste Processing [high quality compost])
- 7 - System 6A (Mixed Waste Processing [low quality compost])

5.2.2 Municipal Finance Criteria Group - Overall System Ranking

The highest ranked systems in terms of Municipal Finance were System 1 (Existing) and System 3A (Direct Cost - revenue neutral) and System 3B (Direct Cost - added revenue). The Existing system represented the least cost to the tax payers in Durham Region and did not present any additional debt costs. While the Direct Cost systems represented very different revenue strategies the overall ranking indicated the systems' relative merits. On the one hand, System 3A (Direct Cost - revenue neutral) imposes a low cost per household and does not require significant capital costs. On the other hand, while System 3B (Direct Cost - added revenue) did not represent additional significant capital costs, it imposed cost on the tax payers. This revenue, however, represented an addition to Durham Region's reserves. Therefore, these funds are then available to assist in further waste management financing for other needed projects. As such, these added funds would be returned to Durham Region's tax payers in the future. Since these added charges were collected as a charge for waste management, it is suggested that the funds could be earmarked and used only for waste management purposes and not to decrease general levy requirements for other municipal services.

System 2 (Existing/Committed) and System 4 (Expanded Blue Box) were second and third highest ranked as the tax requirements and debt burdens did not represent significant effects.

System 6A (Mixed Waste Processing - low quality compost) was the lowest ranked because it represented the highest tax effects and also the highest capital cost. Similarly, while less burdensome, System 6B (Mixed Waste Processing - high quality compost) and

System 5 (Wet/Dry) also represented lower ranked systems (second and third lowest ranked) for debt capacity reasons.

To confirm this ranking, the Municipal Finance Criteria Group also undertook a sensitivity analysis on the key variables that may have affected the criteria indicators. The sensitivity analysis examined variations in capital costs (plus or minus 10% and 20%), rates of waste diversion (plus or minus 5%), variations in operating cost (plus or minus 5% and 10%) differences in waste disposal costs per tonne including the rate Metro Toronto currently charges Durham Region for solid waste disposal and, finally, household growth including a no-growth scenario. While changing the value of the indicators shown above, the sensitivity analysis shows that, given the ranges tested, the general ranking of the systems would not significantly change.

The following summarizes the Durham 3Rs system ranking on the basis of Municipal Finance (highest ranked [i.e. lowest impact] to lowest ranked [i.e. highest impact]):

- 1 - System 1 (Existing)
- 1 - System 3A (Direct Cost [revenue neutral])
- 1 - System 3B (Direct Cost [added revenue])
- 4 - System 2 (Existing/Committed)
- 5 - System 4 (Expanded Blue Box)
- 6 - System 5 (Wet/Dry)
- 7 - System 6B (Mixed Waste Processing [high quality compost])
- 8 - System 6A (Mixed Waste Processing [low quality compost])

5.2.3 Natural Environment Criteria Group - Overall System Ranking

The System 1 (Existing) and System 2 (Existing/Committed) systems were ranked highest for each of the three criteria. As a result, these two systems were ranked equal and highest overall for the Natural Environment Criteria Group. Only a slight difference exists between the next two system rankings. System 4 (Expanded Blue Box) was ranked third overall, slightly ahead of System 3 (Direct Cost). The potential effects on aquatic systems from illegal dumping of wastes was considered to be greater than effects to terrestrial systems and resources due to siting a materials recovery facility (MRF). The potential effects from illegal dumping, associated with System 3 (Direct Cost) were considered greater since they were expected to occur over the duration of the systems operation.

System 5 (Wet/Dry) and System 6 (Mixed Waste Processing) were the second lowest and lowest ranked systems respectively for all three criteria. System 6 (Mixed Waste Processing) was ranked lowest overall. Potential effects to the atmospheric environment from System 6 (Mixed Waste Processing) were considered to be greater than the effects of siting more than one 3Rs facility (i.e. new MRF and compost facilities) for System 5 (Wet/Dry). The potential effects to the atmosphere were expected to occur throughout the life of System 6 (Mixed Waste Processing), whereas the effects of siting new facilities were more readily mitigated.

The overall system ranking for the Natural Environment Criteria Group in Durham Region is as follows (highest ranked [i.e. lowest impact] to lowest ranked [i.e. highest impact]):

- 1 - System 1 (Existing)
- 1 - System 2 (Existing/Committed)
- 3 - System 4 (Expanded Blue Box)
- 4 - System 3 (Direct Cost)
- 5 - System 5 (Wet/Dry)
- 6 - System 6 (Mixed Waste Processing)

5.2.4 Service Criteria Group - Overall System Ranking

By considering the systems' ranking by criteria, and the criteria rankings, an overall Durham Region system ranking was completed for the Service Criteria Group. Any system that received a mix of a lowest and highest ranking for Reliability and Performance (the two top ranked criteria) was ruled out of contention as a highest ranked system. Any such systems were then evaluated by Social Acceptability and Flexibility.

Systems 6 (A+B) (Mixed Waste Processing) received the highest ranking for performance, but the lowest for reliability, and were therefore eliminated from consideration as the highest ranked system. The same was true (in reverse) for System 1 (Existing) and System 2 (Existing/Committed).

System 4 (Expanded Blue Box) was highest ranked for social acceptability, second highest ranked for reliability, and third highest ranked for performance. It was ranked the highest because it combined reasonable performance and reliability with a high degree of social acceptance.

System 5 (Wet/Dry) was ranked second highest, having received a rank of second highest for performance, social acceptability and flexibility, and a rank of second lowest for

reliability: When System 5 is compared to System 3, it has a similar combination of high and low reliability and performance, therefore for the two most important criteria, performance and reliability, these two systems are considered equal. They are also considered equally socially acceptable. However, System 5 receives a higher ranking, as it is more flexible than System 3. Therefore, System 3 (Direct Cost) was ranked third highest.

The Existing, Existing/Committed, and Mixed Waste systems are all ranked equally as lowest. The mixed waste systems combine high performance and flexibility with low reliability. Therefore, there is not strong confidence that they can consistently assure high diversion rates. In addition, they are the least socially acceptable of the systems considered. On this basis, they are ranked lowest, as they do not meet the service objectives of the project. The Existing and Existing/Committed are considered the lowest from a waste diversion point of view. They are second lowest ranked for social acceptability. These systems are ranked lowest on the basis that they cannot meet the service objectives of the project.

In summary, the system ranking under the Service Criteria Grouping in Durham Region was (highest ranked [i.e. low impact] to lowest ranked [i.e. high impact]):

- 1 - System 4 (Expanded Blue Box)
- 2 - System 5 (Wet/Dry)
- 3 - System 3 (Direct Cost)
- 4 - System 1 (Existing)
- 4 - System 2 (Existing/Committed)
- 4 - Systems 6 (A+B) (Mixed Waste Processing)

5.2.5 Social Environment Criteria Group - Overall System Ranking

By considering the systems' ranking by criteria and the criteria rankings, noting that all criteria were ranked equally, an overall system ranking was completed for the Social Environment Criteria Group on a qualitative basis. There may be significant potential effects from the 3Rs systems and the potential effects for each criterion may occur throughout the life of the system and some may continue beyond the planning period.

Systems 3 (Direct Cost) and 4 (Expanded Blue Box) were the highest ranked systems overall. System 4 (Expanded Blue Box) was highest ranked for the criteria potential for broad social impact and distribution of social costs and benefits and second highest for potential local community impacts. System 3 (Direct Cost) was ranked highest for

potential local community impacts and second highest for the other two criteria. Due to some of the uncertainties involved in the analysis, a judgement could not be made on which of the two systems was better than the other.

System 5 (Wet/Dry) was ranked second highest on the basis that it was the second highest ranked for the distribution of social costs and benefits and third highest ranked system for broad social impact criteria. It ranked as the second lowest for potential local community impact. These rankings, overall, provided input to a ranking of System 5 (Wet/Dry) higher than Systems 1, 2, and 6 (Existing, Existing/Committed, Mixed Waste Processing). Although Systems 1 and 2 were ranked higher for the potential local community impact, the rankings for potential for broad social impact and distribution of social costs and benefits were significantly higher for System 5 compared to Systems 1 and 2 (Existing, Existing/Committed).

System 2 (Existing/Committed) was ranked the second lowest. It was ranked the highest for the potential local community impacts criterion and second lowest for the other two social criteria.

Based on the uncertainties involved in the analysis, a judgement could not be made as to whether System 1 (Existing) or System 6 (Mixed Waste Processing) should be ranked higher. System 1 was the highest ranked for potential local community impacts and lowest ranked for both potential for broad social impact and distribution of social costs and benefits. System 6 was also ranked the lowest since it was ranked lowest for potential local community impact, and second lowest for both broad social impact and distribution of social costs and benefits.

A summary of the overall system ranking in Durham Region for the Social Environment Criteria Group is presented below (highest ranked [i.e. low impact] to lowest ranked [i.e. high impact]):

- 1 - System 3 (Direct Cost)
- 1 - System 4 (Expanded Blue Box)
- 3 - System 5 (Wet/Dry)
- 4 - System 2 (Existing/Committed)
- 5 - System 1 (Existing)
- 5 - Systems 6 (A+B) (Mixed Waste Processing)

5.3 GTA IC&I Systems Evaluation

The IC&I systems' evaluation was done in the context of the larger GTA. The following discusses the rankings by criteria group.

5.3.1 Cost Criteria Group - Overall System Ranking

In overall system ranking, total waste management system cost was considered the most important criterion, while the cost per tonne diverted was used to differentiate between systems; if necessary. On this basis, Systems 1 through to 6 were ranked the same, due to similar overall system costs.

5.3.2 Municipal Finance Criteria Group - Overall System Ranking

Under the Municipal Finance Criteria Group, only the criterion "Potential for Impact on Private Sector Industries" was considered in the IC&I 3Rs systems evaluation. As the total system cost difference among the alternative IC&I systems was relatively minor (\$354 to \$419 million), all IC&I systems were considered to be equal for this criteria group.

It should also be noted that the potential for impact on economic development was addressed under the Social Environment Criteria Group.

5.3.3 Natural Environment Criteria Group - Overall System Ranking

The Existing and Existing/Committed systems (Systems 1 and 2, respectively) were both ranked highest for each of the three criteria. These two systems do not require any new 3Rs facilities, increased vehicle collection requirements or increase in IC&I organics processing. Systems 1 and 2 will result in the lowest potential for effects to the natural environment. Systems 3 and 4 (Extended 3Rs Regulations, Expanded 3Rs Regulations) both require the expansion of existing material recovery facilities or the siting of new material recovery facilities. The siting of these new facilities may result in potential effects to both terrestrial systems and aquatic systems. Increased collection vehicle requirements are also required, resulting in additional emissions to the atmosphere. Systems 3 and 4 were ranked second highest for all these criteria. Overall, Systems 3 and 4 (Extended 3Rs Regulations, Expanded 3Rs Regulations) were also ranked second highest.

IC&I System 5 and System 6 (Expanded 3Rs Regulations with Organics, Processing All IC&I Waste) were both ranked lowest. These two systems required increased processing capacity for dry recyclables and IC&I organics. This included the siting of new MRFs and compost facilities. These systems were expected to have the greatest effects on terrestrial and aquatic systems due to siting new facilities and discharges from the new compost facilities. In addition, these systems had the largest collection vehicle requirements and largest amount of IC&I organics processing. Systems 5 and 6 were expected to have the greatest level of emissions to the atmosphere for all of the systems.

The overall IC&I system ranking for the Natural Environment Criteria Group is as follows (highest ranked [i.e. low impact] to lowest ranked [i.e. high impact]):

- 1 - System 1 (Existing)
- 1 - System 2 (Existing/Committed)
- 3 - System 3 (Extended 3Rs Regulations)
- 3 - System 4 (Expanded 3Rs Regulations)
- 5 - System 5 (Expanded 3Rs Regulations with Organics)
- 5 - System 6 (Processing All IC&I Waste)

5.3.4 Service Criteria Group - Overall System Ranking

By considering the systems ranking by criteria and the ranking of importance of criteria, an overall system ranking was completed for the Service Criteria Group. Social acceptability, performance and reliability were considered of greatest importance, while flexibility was considered of less importance. Any system that received a mix of a lowest and highest ranking for reliability, performance and social acceptability (the top ranked criteria) was ruled out of contention as a highest ranked system.

Systems 3 and 4 (Extended 3Rs Regulations, Expanded 3Rs Regulations) were the highest ranked systems, using the ranking system discussed above. System 3 ranked highest for social acceptability and second highest for reliability and so, was ranked highest overall. Its performance was third highest, but was greater than 50% diversion, and was therefore considered acceptable. System 4 ranked second highest for social acceptability, while it ranked better than System 3 in terms of performance and flexibility because it diverted a greater range and quantity of materials from a wider selection of industrial sectors. Therefore, on balance it was considered second highest ranked.

Systems 2 (Existing/Committed) was ranked third highest. It was considered the most reliable, but it compared less favourably to Systems 3 and 4 (Extended 3Rs Regulations,

Expanded 3Rs Regulations) in terms of performance, social acceptability and flexibility. It ranked higher than System 2 for flexibility and performance, and therefore on balance was also considered to be higher ranked, and was ranked third highest overall.

Systems 6 and 1 (Processing All IC&I Waste, Existing) were lowest ranked, but for different reasons. The performance of System 6 was considered best, but it was considered lowest ranked with respect to reliability and social acceptability. System 1 (Existing) was ranked most reliable, but in terms of performance it was lowest ranked and second lowest ranked for social acceptability. It was considered less flexible than System 6, but because social acceptability is considered a more important criterion, System 1 is considered higher ranked than System 6. Therefore, System 6 (Processing All IC&I Waste) is ranked lowest, and System 1 (Existing) second lowest.

System 5 (Expanded 3Rs Regulations with Organics) was ranked third lowest. Its performance was second highest but it was ranked lower than Systems 2, 3 and 4 in terms of reliability and social acceptability. It was ranked higher than System 1 for flexibility and equal to System 1 for social acceptability, therefore, overall it ranked higher than System 1.

In summary, the IC&I system ranking under the Service Criteria Grouping was (highest ranked [i.e. low impact] to lowest ranked [i.e. high impact]):

- 1 - System 3 (Extended 3Rs Regulations)
- 2 - System 4 (Expanded 3Rs Regulations)
- 3 - System 2 (Existing/Committed)
- 3 - System 5 (Expanded 3Rs Regulations with Organics)
- 5 - System 1 (Existing)
- 6 - System 6 (Processing All IC&I Waste)

5.3.5 Social Environment Criteria Group - Overall System Ranking

By considering the systems ranking by criteria and the criteria rankings (noting that all criteria are ranked equally), an overall system ranking could be completed for the Social Environment Criteria Group on a qualitative basis. The evaluation considered trade-offs among the rankings for each system and criterion recognizing that there may be significant potential effects from the 3Rs systems and the potential effects for each criterion may occur throughout the life of the system and some may continue beyond the planning period.

System 2 (Existing/Committed) was the highest ranked system overall. It ranked highest for all three criteria.

Systems 1 (Existing), 3 (Extended 3Rs Regulations) and 4 (Expanded 3Rs Regulations) were ranked equally as the second highest overall. While Systems 3 and 4 were ranked the second highest for all three criteria, System 1 (Existing) was ranked the highest for potential local community impacts, second highest for distribution of social costs and benefits and the third highest for potential for broad social impact. Therefore the systems were ranked equal.

System 5 (Expanded 3Rs Regulations with Organics) was ranked as the second lowest overall on the basis that it was the second highest for the potential for broad social impact, second lowest for the potential local community impacts and lowest for the distribution of social costs and benefits.

System 6 (Processing All IC&I Waste) was the lowest ranked, because it was ranked the lowest for all three criteria.

A list of the overall IC&I system ranking for the Social Environment Criteria Group follows (highest ranked [i.e. low impact] to lowest ranked [i.e. high impact]):

- 1 - System 2 (Existing/Committed)
- 2 - System 1 (Existing)
- 2 - System 3 (Extended 3Rs Regulations)
- 2 - System 4 (Expanded 3Rs Regulations)
- 5 - System 5 (Expanded 3Rs Regulations with Organics)
- 6 - System 6 (Processing All IC&I Waste)

6.0 DIVERSION ESTIMATES FOR DURHAM REGION

The diversion potentials for each service area depend on which residential and IC&I systems are combined to form any waste diversion system.

Excluding the Existing system (as both the residential and IC&I Existing systems will be replaced by the Existing/Committed systems by 1996), there are five residential and five IC&I systems which could be combined 25 different ways for each service area. The cumulative tonnes (1996 to 2015) of waste that could be diverted through reduction and reuse/recycling, and the cumulative diversion rate (expressed as a percentage of total

waste generated) by service area, were estimated for each of these system combinations. Table 6.1 illustrates these combinations and diversion rates.

At the low end of the range, the combination of Existing/Committed residential and IC&I systems could divert an estimated 41% of the waste generated between 1996 and 2015, by the year 2015. This totals 4.0 million tonnes of diversion in the 20-year period, made up of an estimated 3.1 million tonnes (32%) of waste reused/recycled, and 0.9 million tonnes (9%) of waste reduced.

Other combinations of residential and IC&I systems achieve higher diversions. The highest potential diversion is achieved by the combination of Mixed Waste Processing of residential waste (with marketing of finished compost), and a policy of Processing all IC&I Waste. This combination could reasonably divert 7.4 million to 8.2 million tonnes (75% to 83%) in the 20-year period. The range relates to the quality of the finished compost from the mixed waste plant, and whether it can be classified for unrestricted use.

In summary, Table 6.1 shows that the combinations of systems examined for Durham Region could divert a range of 4 million to 8.2 million tonnes of waste in the Region between 1996 and 2015. This translates to 41% to 83% of the Durham waste stream.

7.0 CONCLUSIONS

Section 15 of the *Waste Management Act*, 1992 (WMA) stipulates that the environmental assessments for the IWA landfill waste disposal sites are to contain, among other matters, a description of, a statement of rationale for, and a description and evaluation of any matter relating to reduction, reuse and recycling of waste (3Rs) as an alternative to the landfill waste disposal sites. The GTA 3Rs Analysis provides such a description and evaluation of possible 3Rs systems, and the results appear in Sections 5.2 and 5.3 of this summary report.

The Act (Section 14) also stipulates that for each site proposed by the IWA as an undertaking, the Minister of the Environment (and Energy) is to provide a written estimate to the IWA as to the amount of waste expected to be diverted from the proposed landfill waste disposal site by waste reduction, and by waste reuse and recycling. These estimates were provided by Minister's letter dated May 15, 1992. The GTA 3Rs Analysis EA Input Document provides additional analysis of 3Rs activities in support of the waste diversion estimates previously provided.

TABLE 6.1
SUMMARY OF DIVERSION DATA FOR COMBINATION
OF RESIDENTIAL AND IC&I SYSTEMS
DURHAM REGION

Scenario		Cumulative Diversion (2015)									
Residential	IC&I	Reduction		Reuse/Recycling				Total Diversion			
		%	tonnes (millions)	%	Low	High	tonnes (millions)	%	Low	High	tonnes (millions)
Existing/ Committed	Existing/ Committed	9%	0.90	32%			3.10	41%			4.00
	Extended 3Rs	9%	0.90	40%			3.97	50%			4.87
	Expanded 3Rs	9%	0.90	45%			4.43	54%			5.32
	Expanded 3Rs with Organics	9%	0.90	48%			4.73	57%			5.63
	No Unprocessed Waste to Landfill	9%	0.90	53%			5.19	62%			6.09
Direct Cost	Existing/ Committed	9%	0.90	38%	40%		3.74	47%	49%		4.63
	Extended 3Rs	9%	0.90	47%	49%		4.60	56%	58%		5.50
	Expanded 3Rs	9%	0.90	52%	54%		5.06	61%	63%		5.96
	Expanded 3Rs with Organics	9%	0.90	55%	57%		5.37	64%	66%		6.27
	No Unprocessed Waste to Landfill	9%	0.90	59%	62%		5.83	68%	71%		6.73
Expanded Blue Box	Existing/ Committed	9%	0.90	40%	43%		3.94	49%	52%		4.83
	Extended 3Rs	9%	0.90	49%	52%		4.80	58%	61%		5.70
	Expanded 3Rs	9%	0.90	54%	57%		5.26	63%	66%		6.16
	Expanded 3Rs with Organics	9%	0.90	57%	60%		5.57	66%	69%		6.47
	No Unprocessed Waste to Landfill	9%	0.90	61%	65%		6.03	70%	74%		6.92
Wet/Dry	Existing/ Committed	9%	0.90	46%	47%		4.50	55%	56%		5.39
	Extended 3Rs	9%	0.90	55%	56%		5.36	64%	65%		6.26
	Expanded 3Rs	9%	0.90	59%	60%		5.82	68%	69%		6.72
	Expanded 3Rs with Organics	9%	0.90	62%	63%		6.13	71%	73%		7.03
	No Unprocessed Waste to Landfill	9%	0.90	67%	68%		6.59	76%	77%		7.49
Mixed Waste Processing	Existing/ Committed	9%	0.90	45%	53%		4.43	54%	62%		5.32
	Extended 3Rs	9%	0.90	54%	62%		5.29	63%	71%		6.19
	Expanded 3Rs	9%	0.90	59%	67%		5.75	68%	76%		6.65
	Expanded 3Rs with Organics	9%	0.90	62%	70%		6.06	71%	79%		6.95
	No Unprocessed Waste to Landfill	9%	0.90	66%	74%		6.52	75%	83%		7.41

Specifically, the study has shown that when combined, each of the possible Region of Durham systems examined (IC&I plus residential), could result in a source reduction of 0.9 million tonnes representing a 9% diversion rate. Through reuse and recycling efforts, 3.1 million to 7.3 million tonnes could reasonably be diverted. This translates to 32% to 74% of the waste stream. When reduction and reuse/recycling efforts are combined, the 25 combinations of residential and IC&I systems for Durham Region could divert a range of 4 million to 8.2 million tonnes of waste, or 41% to 83% of the waste stream.

The estimates of waste diversion for Durham Region show that of the 25 options considered, 22 have the ability to divert 50% or more of the generated waste stream in the 20-year period between 1996 and 2015.

The analysis further shows that the written estimates provided by the Minister of Environment to the IWA in May 1992, fall within the range of waste diversion achievable by a number of combinations of residential and IC&I systems within Durham Region.

The systems presented and evaluated were not designed as plans for any of the Regions or service areas. They were chosen to estimate the impacts of a number of different possible approaches to waste diversion. They are not considered a complete list of all possible combinations of components which could form waste diversion systems, and a comprehensive mix and match of components has not been attempted. The systems were chosen to provide a reasonable range of diversion options, and to estimate the impacts of these options.

For More Information

Copies of the complete draft GTA 3Rs Analysis documentation, including technical appendices, are available for review at the IWA Information Centres and other public locations such as libraries and municipal offices within the Greater Toronto Area.

Additional copies of this report, or Summary Reports for the other service areas, may be obtained by calling the following telephone numbers:

Durham Region IWA Information Centre:	1-800-661-9294
Metro Toronto/York Region Information Centre:	1-800-463-8484
Peel Region IWA Information Centre:	1-800-361-5448

APPENDIX A

MOEE Minister's May 15 1992, Letter



Ministry
of the
Environment

Ministère
de
l'Environnement

cc of the
copy
cc of the
copy

May 15, 1992

135 St. Clair Avenue West
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Toronto, Ontario
M4V 1P5
416/323-4359

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Ms. Jan Rush, Chair
Interim Waste Authority,
20 Bay Street, Suite 1625,
Toronto, Ontario.
M5J 2N8

Dear Ms. Rush:

In accordance with section 14 of the Waste Management Act, 1992, shown below are estimates of the cumulative amounts of waste that will be diverted from disposal over the period 1996 to 2015 due to waste reduction, and reuse and recycling. All numbers are in millions of tonnes.

	Waste Diversion Estimate	
	Reduction	Reuse & Recycling
Metropolitan Toronto and York Region	18.7	18.1
Peel Region	5.2	6.2
Durham Region	2.6	3.9

Yours sincerely,

Ruth Grier
Minister

